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## FIRST REGULAR MEETING OF THE MISSOURI SECTION.

Pursuant to the call from the committee appointed some time ago by Professor E. R. Hedrick, about forty-two men and women from universities, colleges, normal and high schools of Missouri, and some not connected with any educational institution but interested in mathematics, gathered in St. Louis at the Central High School on Saturday morning, Nov. 18, for the first regular meeting of The Missouri Section of The Mathematical Association of America. Professor C. A. Waldo called the meeting to order. Professor Hedrick was elected temporary Chairman and Mr. A. H. Huntington, temporary Secretary. Professor Hedrick gave a short report about the beginnings of this Section in the unorganized meeting one year ago at Washington University, and told of the subsequent successful organization of The Mathematical Association of America.

In accordance with the provision of the Constitution of the Association in regard to sections, the following members of the Association in attendance completed the formal organization of the Missouri Section:

L. D. Ames, University of Missouri, Columbia.
Charles Ammerman, McKinley High School, St. Louis.
C. J. Borgmeyer, St. Louis University, St. Louis.
Dorothy G. Calman, St. Louis.
Alan D. Campbell, Washington University, St. Louis.
Byron Cosby, State Normal School, Kirksville.
Otto Dunkel, Washington University, St. Louis.
Zoe Ferguson, Central High School, St. Joseph.
B. F. Finkel, Drury College, Springfield.
E. R. Hedrick, University of Missouri, Columbia.
A. H. Huntington, Central High School, St. Louis.
Byron Ingold, Christian University, Canton.
Louis Ingold, University of Missouri, Columbia.
Thos. W. Jackson, Fulton High School, Fulton.
G. H. Jamison, State Normal School, Kirksville.
Albert R. Nauer, Mechanical Engineer, St. Louis.
Paul R. Rider, Washington University, St. Louis.
W. H. Roever, Washington University, St. Louis.
Wallis G. Rowe, Smith Manual High School, St. Louis.
A. J. Schwartz, Cleveland High School, St. Louis.
J. I. Shannon, St. Louis University, St. Louis.
H. P. Stellwagen, Yeatman High School, St. Louis.
C. A. Waldo, Washington University, St. Louis.
Eula A. Weeks, Cleveland High School, St. Louis.
R. A. Wells, Park College, Parkville.
W. H. Zeigel, State Normal School, Kirksville.

A constitution for the Section was submitted and adopted; and the election of permanent officers for the coming year resulted as follows: President, Professor

C. A. Waldo, Washington University; Vice-President, Professor L. D. Ames, University of Missouri; Secretary-Treasurer, Mr. Albert H. Huntington, Central High School, St. Louis. After the election of officers, about three hours were given to the reading of papers, when adjournment was taken in a body to a near-by restaurant and the good fellowship of the meeting was continued.

Keen delight and satisfaction were expressed by all, the only criticism being that not enough time was given to the discussion of the papers. Here follows the program as presented.

## ABSTRACTS OF PAPERS.

1. *A Course for Juniors in the School of Education.* By Professor L. D. AMES, University of Missouri.

Professor Ames described a course which for several years he has been giving in the University of Missouri for juniors in the school of education. Most of these students are preparing to teach in high schools, either in mathematics or in other departments. Many of them cannot take more than one or two years of mathematics beyond the calculus. It seems desirable to give them as broad a range of topics as is consistent with a clear grasp of the subject matter and the ability to apply it. This is done by putting emphasis on fundamentals, requiring the solution of carefully selected problems based on the fundamentals, but avoiding all unnecessary complications, requiring sound logic where logic is needed for clear understanding or vivid memory, but making frank use of assumptions where intuition and applications adequately serve these purposes. The amount of serious problem work or of thorough logic is not less than in the standard courses, but these are applied to fundamentals covering a large range. No undue effort is made towards fusion, but relations between topics are brought out where these are natural and useful. History is taught where it helps to an appreciation of subject matter, but the historical order is not followed. Topics are selected from all branches of mathematics as experience shows them to be workable. Algebra, geometry, and mechanics are represented. Perspective, graphical statics, foundations, non-euclidean geometry, a study of the number system, projective geometry, probabilities, finite groups, are typical topics. And withal it is believed that the impressions are not less vivid than in the standard courses.

2. *Graphical Solution of Spherical Triangles.* By Professor W. H. ROEVER, Washington University.

Professor Roever showed how to construct in the plane by means of circles and straight lines, the solutions of the six fundamental problems of spherical trigonometry. The statement of the rules was made so as to include all the possibilities which arise in the solution of the convex trihedral (spherical triangle of parts less than 180°). The rules are not always stated with sufficient generality, even in the standard foreign treatises on descriptive geometry.

3. *The Place of the Calculus in the Training of the High School Teacher.* By Professor BYRON COSBY, Kirksville Normal School.

Professor Cosby showed that parts of the calculus might well be given in place of parts of high-school algebra, being more economical of students' time and giving a better idea of the whole range of the mathematical field and of the continuity of the subject. Therefore the teacher should be equipped with the calculus.

4. *A Geometric Treatment of the Exponential Function.* By Dr. OTTO DUNKEL, Washington University.

In this paper the area under the hyperbola $y = 1/x$ was considered and the number $e$ was defined as the abscissa of the point up to which the area is unity. From this definition the area up to any point was determined by elementary methods, using the principle of stretching (compressing) an area by stretching (compressing) all of its parallel chords in the same ratio. Having obtained an expression for the area, the derivative of $e^x$ or of $\log_e x$ can be obtained from it rather simply. A method was then given for obtaining polynomial approximations to $e^x$, and from these closer approximations can be obtained for $e$ than those given in the definition of $e$.

5. *Formulas for Approximate Integration.* By Professor BYRON INGOLD, Christian University.

A number of quite general formulas are known for approximating the value of a definite integral; for example, the well-known formulas of Gauss and the more recent formulas of Birkhoff. The formulas of Gauss, however, are inconvenient because of the fact that the division points of the interval of integration are in general irrational. It was the purpose of Professor Ingold's paper to obtain formulas comparable with the prismatoid formula in ease of application.

Among the formulas obtained may be mentioned:

$$\int_x^{x+h} f'(x)dx = \frac{h}{10}\left[ f'(x) + 5f'\left(x + \frac{h}{3}\right) + 4f'\left(x + \frac{5h}{6}\right)\right],$$

obtained by inserting unknown coefficients and comparing with the expansion by Taylor's formula. This formula is usually better than the prismatoid formula for small values of $h$.

Other formulas deduced by methods analogous to the above are:

$$\int_x^{x+h} f'(x)dx = \frac{h}{4}\left[ f'(x) + 3f'\left(x + \frac{2h}{3}\right)\right],$$

more accurate than the trapezoid formula in the third term of the expansion; and

$$\int_x^{x+h} f'(x)dx = hf'\left(x + \frac{h}{2}\right) + \frac{h^3}{24} f'''\left(x + \frac{h}{2}\right).$$

6. *Claims of Mathematics in the High School Course of Study.* By Mr. H. P. STELLWAGEN, Yeatman High School.

Mr. Stellwagen gave a résumé of the recent criticisms of the mathematics in the present course of study in the high schools of St. Louis, presented the general reasons, advanced by a committee of which he is chairman, for the retention of mathematics as a required subject, and invited discussion, in which as many took part as the time would permit.

7. *An Illustration of a Certain Necessary Condition in Minimizing a Definite Integral with a Discontinuous Integrand.* By Dr. PAUL R. RIDER, Washington University.

A curve $C$, which passes from a point $P_0$ to a curve $D$ and thence to a point $P_2$ on the opposite side of $D$, minimizes the sum of the two integrals $I = \int F(x, y, x', y')dt$, $i = \int f(x, y, x', y')dt$. The first integral is to be taken along the arc from the point $P_0$ to the curve $D$, the second from $D$ to $P_2$. Then at $P_1$, the point where the two arcs of the curve $C$ meet the curve $D$, a certain relation must exist between the slope of the tangent to the curve $D$ and the partial derivatives of $F$ and $f$ with respect to $x'$ and $y'$. This paper illustrates the condition given in a problem that recently appeared in the MONTHLY (Vol. XXIII, page 125).

8. *On a Method of Sectioning Freshman and Sophomore Classes in Mathematics.* By Mr. ALAN CAMPBELL, Washington University.

This paper described a method in use in Washington University of dividing the freshman class in the schools of engineering and architecture into fast, medium, and slow sections. The sectioning is done on the basis of marks made by the students in tests covering high school mathematics, given during the first day or two of the college year. The sophomores are divided according to the grade of work they did in freshman year. This separation of good and poor students gives the better sections a chance to push forward much more rapidly, while the other sections move at a pace suited to the needs of the slower workers.

9. *The Equations and Models of a Large Group of Warped Surfaces.* By Professor C. A. WALDO, Washington University.

In this paper it was shown how to construct easily the models and the Cartesian equations of warped surfaces of two rectilinear directrices and one curvilinear (in particular rectilinear) directrix. These surfaces are special cases of surfaces called by Loria axoids and pseudoaxoids.

ALBERT H. HUNTINGTON,
*Secretary.*